ISSN 2029–1213

KAUNAS UNIVERSITY OF TECHNOLOGY

ADVANCED CONSTRUCTION 2014

PROCEEDINGS OF THE 4TH INTERNATIONAL CONFERENCE

9–10 October, 2014 Kaunas, Lithuania

Conference is organized by Kaunas University of Technology.

Conference is supported by Republic of Lithuania and the European Social Fund. Project "Strengthening of Lithuanian Construction Technology Platform and Optimization of Research Directions in Construction Sector" NR. VP1-3.1-ŠMM-05-K-02-006. / Konferencija finansuojama Lietuvos Respublikos ir Europos socialinio fondo lėšomis. Projektas „Lietuvos statybų technologinės platformos (LSTP) stiprinimas bei statybos sektoriaus mokslo tyrimų krypčių optimizavimas" NR. VP1-3.1-ŠMM-05-K-02-006).

The proceedings of the 4th International Conference ADVANCED CONSTRUCTION 2014 contain selected papers and extended abstracts. Full text of extended abstracts could be found in open access *Journal of Sustainable Architecture and Civil Engineering (www.sace.ktu.lt).*

All papers were reviewed.

The style and language of authors were not corrected. Only minor editorial corrections have been carried out by the Publisher.

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Proceedings of the 4TH INTERNATIONAL CONFERENCE ADVANCED CONSTRUCTION
9 – 10 October, 2014, Kaunas, Lithuania
Kaunas University of Technology, Faculty of Civil Engineering and Architecture

Design Methodology Analysis of Cross Laminated Timber Elements Subjected to Flexure

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EXTENDED ABSTRACT

Timber is one of the oldest and most traditional building materials, which combines interesting and aesthetics looks, variable textures, combined with proper strength and flexibility. Timber as a structural material is environmentally friendly in relation to bio-recovery and with minimal resources for providing it. Wood is the world's most sustainable building material. Unlike concrete and steel, wood has zero "embodied carbon"(the amount of carbon used in the process of manufacturing a building product).

Using of cross – laminated timber enables to obtain reliable load – bearing members and meets and aesthetic and architectural requirements at the same time.

Cross-laminated timber is a structural material, which successfully used for structural purposes during the last years. The material is environmentally friendly and decreases CO_2 emissions. Cross-laminated timber possesses a decreased level of anisotropy in comparison with solid and glued timber. It is significant for structural units working in bending. So, cross-laminated timber panels are considered as an object of investigation. Design methodology for cross-laminated timber panels subjected to flexure was presented. The methodology is based on LVS EN1995-1-1 and laminated plate theory. According to methodology we can offer two design methods for bending calculations of CLT: Reduced cross – section method and effective strength, stiffness method

The study includes six stages, where the slab layer dimensions chosen by the recommended literature and information available. The presented methodology was tested experimentally and analytically. Behavior and mechanical properties of cross-laminated timber are analyzed for case of static loading. Two panels with thickness 95mm consisting from three layers were tested in laboratory. Freely supported panels with span equal to 2m, which is loaded by the uniformly distributed load was a design scheme of considered panels. The panel's width was equal to 1m. Analytical FEM design method, which is based on the using of computational program ANSYSv14 and RFEM5.0, was checked by the experiment. The comparison of stresses acting in the edge fibers and vertical displacements shows that the considered design methodology can be used for engineering calculations.

Comparing methodology of calculations and experimental results the difference between results were up to 30%. Result difference for cross and parallel laminated timber plates - load bearing capacity, horizontal displacement and deflection varies up to 10%, it can be concluded that the middle layer does not give a significant effect on the load - bearing capacity loss. The transversal layer provides a homogeneous and solid system.

Finite element program for the calculation of accurate results in comparison with the calculation methodology showed RFEM5.0 program with differences up to 10% and 15%The program ANSYS up to 15%. RFEM5.0 increased accuracy of results increases built up functions for both EN1995-1-1 and GEM.

Comparison of results between cross and parallel laminated timber in relative deformations, the difference is up to 6%. The cross – laminated timber middle layer does not affect load – bearing capacity. The middle layer decreases only 10 % of load – bearing capacity.

Keywords: *cross laminated timber, numerical model, mechanical properties, and laboratorial test.*

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